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JC675 U.S. PRO
09/998637
11/30/01

Has received an application for a patent for a new and useful invention. The title and description of the invention are enclosed. The requirements of law have been complied with, and it has been determined that a patent on the invention shall be granted under the law.

Therefore, this

United States Patent

Grants to the person(s) having title to this patent the right to exclude others from making, using, offering for sale, or selling the invention throughout the United States of America or importing the invention into the United States of America for the term set forth below, subject to the payment of maintenance fees as provided by law.

If this application was filed prior to June 8, 1995, the term of this patent is the longer of seventeen years from the date of grant of this patent or twenty years from the earliest effective U.S. filing date of the application, subject to any statutory extension.

If this application was filed on or after June 8, 1995, the term of this patent is twenty years from the U.S. filing date, subject to any statutory extension. If the application contains a specific reference to an earlier filed application or applications under 35 U.S.C. 120, 121 or 365(c), the term of the patent is twenty years from the date on which the earliest application was filed, subject to any statutory extension.

A handwritten signature in black ink, appearing to read "Todd Johnson".

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A handwritten signature in black ink, appearing to read "Sandra L. Morton". Below the signature, the word "Attest" is written in a smaller, cursive font.



US005996431A

United States Patent [19]

Pierce

[11] Patent Number: 5,996,431

[45] Date of Patent: Dec. 7, 1999

[54] TWIST ACTION FRICTION DRIVE

61038256 2/1986 Japan.

[75] Inventor: Michael George Pierse, Bedford, United Kingdom

OTHER PUBLICATIONS

[73] Assignee: Unova U.K. Limited, Aylesbury, United Kingdom

Marks' Standard Handbook For Mechanical Engineers, 10th Ed. pp. 8-130 to 8-131.

[21] Appl. No.: 09/051,248

Primary Examiner—Tamara L. Graysay
Assistant Examiner—David Fenstermacher

[22] PCT Filed: Apr. 30, 1997

Attorney, Agent, or Firm—Lee, Mann, Smith, McWilliams.

[86] PCT No.: PCT/GB97/01174

Sweeney & Ohlson

§ 371 Date: Apr. 2, 1998

[57] ABSTRACT

§ 102(e) Date: Apr. 2, 1998

A twist action roller friction drive comprises a rotating drive bar which drives in rotation a roller the axis of rotation of which is inclined relative to the axis of a rotationally fixed driven member with which the roller engages. The inclined roller comprises a single annular roller urged from the inside into driving contact with the driven member by one or more hydrostatic pads. The driven member is a tube and the skewed annular roller is in frictional engagement with the bore of the tube. In a typical use, the tube is fixed to the carriage of a machine tool and is aligned with the machine axis. Oil for the hydrostatic pad(s) acting on the roller is supplied through the drive bar along the axis thereof. At its trailing end, the drive bar rotationally drives a skewed roller assembly in which the annular roller is incorporated, the remote forward end of the drive bar being driven in rotation, as by an electric motor. Axial movement of the driven member is principally determined by the angle of skew of the roller so that if this angle is made very small, similarly small precise axial movements of the driven member of as little as 1 nm (nanometre) or less can be readily achieved, per revolution of the drive bar. This permits a high speed drive motor and in turn velocity feed back control.

[87] PCT Pub. No.: WO98/10206

PCT Pub. Date: May 12, 1998

[30] Foreign Application Priority Data

Sep. 6, 1996 [GB] United Kingdom 9618642

[56] References Cited

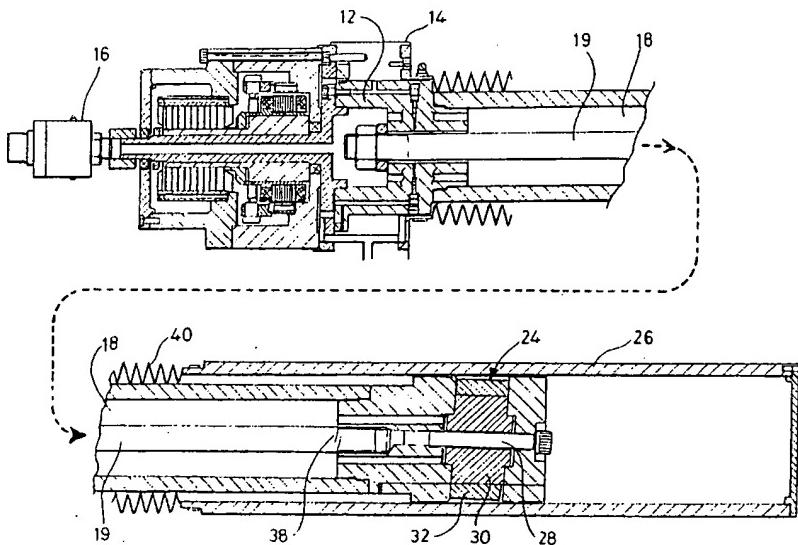
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17 Claims, 4 Drawing Sheets



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